Swinburne University of Technology

Faculty of Science, Engineering and Technology

FINAL EXAM COVER SHEET

Subject Code: COS30008
Subject Title: Data Structures & Patterns
Due date: June 3, 2021, 13:00
Lecturer: Dr. Markus Lumpe

Your name: Khang Trinh **Your student id:** 102118468

Check Tutorial	Wed 08:30	Wed 10:30	Wed 16:30	Thurs 08:30	Thurs 10:30	Thurs 14:30	Thurs 16:30	Fri 08:30	Fri 10:30	Fri 14:30
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Marker's comments:

Problem	Marks	Time Estimate in minutes	Obtained
1	50	20	
2	54	15	
3	42	10	
4	60	15	
5	8+128=136	60	
Total	342	120	

This test requires approx. 2 hours and accounts for 50% of your overall mark.

Problem 1 (50 marks)

Answer the following questions in one or two sentences:

a. How can we construct a tree where all subtrees have the same degree? (4 marks)

1a) we create a special notation called the empty tree

b. What are reference data members and how do we initialize them? (2 marks)

1b) they are used when the object they refer to exists outside of the scope of the class. They can be initialized via constructor initializer list

c. What is the difference between l-value and r-value references? (6 marks)

1c) r-values are temporary values (ie. 10, "word", etc.)
l-values are values with address in memory/a variable (ie. int a, float b, etc.)

d. What is an object adapter? (6 marks)

1d) it lets 2 mutually incompatible interfaces communicate with each other (it acts as a bridge between these 2 objects)

e. What is a key concept of an abstract data types? (4 marks)

1e) the interface: the representation of the data type
the implementation: provides operations to manipulate the data type

f. How do we define mutual dependent classes in C++? (4 marks)

1f)

we use forward declaration on at least 1 class

g. What must a value-based data type define in C++? (2 marks)

1g)

- they have a copy constructor that creates a copy of another variable
- has an assignment operator that assigns itself a copy of other variables
- changes to one variable never affects the value of another variable
- are usually allocated on the stack

h. What is the difference between copy constructor and assignment operator and how do we guarantee safe operation? (8 marks)

1h)

copy constructor assigns new memory for the value, whereas assignment operator doesn't

i. What is the best-case, average-case, and worse-case for a lookup in a binary tree? (6 marks)

1i)

best: O(1)
average: O(logn)
worst: O(n)

j. You are given a set of n-1 numbers out of n numbers. How do we find the missing number n_k, $1 \leq k \leq n$, in linear time? (8 marks)

1j)